- PATENT -

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPELLANT:	Stephens et al.	EXAMINER:	Gonzalez, Amancio
APPL. NO.:	10/541,966	GROUP:	2617
FILING DATE:	07/11/2005	CASE NO.:	CE31023P

TITLED: Method For Determining A Coverage Area in a Cell Based Communication

Motorola, Inc.
Corporate Offices
1303 E. Algonquin Road
Schaumburg, IL 60196

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner of Patents
P.O. Box 1450
Alexandria, Va. 22313-1450

Commissioner:

The appellants hereby respectfully submit the following Appeal Brief in response to the Advisory Action of March 22, 2007 and a Final Office Action dated January 19, 2007, with a Notice of Appeal filed herewith.

1. REAL PARTY IN INTEREST

The real party in interest in this appeal is Motorola, Inc., a Delaware corporation having a primary place of business in Schaumburg, Illinois.

2. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal.

3. STATUS OF CLAIMS

This is an appeal from a Final Office Action, dated January 19, 2007. Claims 1-4, 6-9, 12-14 and 16-21 pending and presently stand once and finally rejected and constitute the subject matter of this appeal. Claims 1-4, 6-9, 12-14 and 16-21 are appealed.

In a First Office Action dated October 23, 2006, the Examiner rejected 1, 2, 4, 6, 9, 12, 14, 16, 18, 19 and 21 under 35 U.S.C. §102(b) as being anticipated by Shafran et al. (US Publ. 2003/0186693), rejected Claims 3 and 13 under 35 U.S.C. §103(a) as being unpatentable over Shafran in view of US Prov. 60/369,368, rejected Claims 5 and 15 under 35 U.S.C. §103(a) as being unpatentable over Shafran in view of Dillinger et al. (US Publ. 2004/0058679), rejected Claims 7 and 20 under 35 U.S.C. §103(a) as being unpatentable over Shafran in view of Andersson (US 6,173,168), and rejected Claim 8 under 35 U.S.C. §103(a) as being unpatentable over Shafran in view of Tse (US 6480718). In an amendment and response dated November 14, 2006, the appellants replied to the First Office Action with an amendment to claims 1 and 12.

In a Final Office Action dated January 19, 2007, the Examiner rejected Claims 1, 2, 4, 6, 9, 12, 14, 16, 18, 19 and 21 under 35 U.S.C. §103(a) as being anticipated by Shafran et al. (US 2003/0186693), in view of Dillinger et al. (US 2004/0058679) and further in view of Croslin (US 6295275), rejected Claims 3 and 13 under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of US Prov. 60/369,368, and rejected Claims 7 and 20 under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of Andersson (US 6,173,168). In an amendment after final rejection and response dated February 1, 2007, the appellants replied to the Final Office Action with an amendment to claims 1-4, 6-9 and 12.

The pending claims 1-4, 6-9, 12-14 and 16-21 filed and entered after the Final Office Action are reproduced below.

4. STATUS OF AMENDMENTS

A Response to the Final Office Action was filed on February 1, 2007, and is currently pending. In the Response to the Final Office Action, the appellants responded to the Examiner's rejection of claims 1-4, 6-9, 12-14 and 16-21.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to determining the coverage area of a cell in a cellular communication system. The invention utilizing such coverage area information to assist alarm prioritization due to cell outage and/or to re-configure a system's or cell's operational parameters to minimize the degree of overlapping coverage, thereby allowing higher capacity/quality frequency plans to be deployed. Specifically, the present invention uses measurement reports (MRs) to determine the unique coverage area and the potential interfering (overlapping) coverage generated by each cell. By utilizing MRs in this manner, a Network Operator is able to direct and prioritize both automatic and manual maintenance and optimization activities, such as alarm prioritization, to distinguish the more critical coverage areas. More specifically, the present invention uses measurement reports (MRs) to determine both the unique and overlapping (and therefore interfering) coverage areas generated by each cell. Three aspects of a respective cell's coverage may be determined: (i) The amount of traffic that receives coverage uniquely from this cell; (ii) The amount of traffic that receives coverage from this cell, but which could also obtain coverage from an adjacent cell; and (iii) The amount of traffic carried by adjacent cells that could provide coverage to this cell.

In particular, Claim 1 provides a method (300 of Fig. 3) of determining per-cell traffic overlap coverage in a cellular communication system (100) that comprises multiple cells. The method includes one step of receiving measurements (305 of Fig. 3 and page 18 lines 14-21) of parameters relating to one or more operations of a first cell in a cellular communication system, wherein said parameters include information relating to how many and which cells serve a wireless subscriber communication unit. The method

includes another step of calculating (310 of Fig. 3 and page 18 lines 23-32) a degree of coverage overlap for said first cell based on a number of said measurements by partitioning said measurements into at least one of three categories with respect to the first cell, selected from the group of: (i) A first category where the measurement indicates a wireless subscriber unit that is uniquely served by the first cell, (ii) A second category where the measurement indicates a wireless subscriber unit that can be served by cells other than the first cell, and (iii) A third category where the measurement indicates a wireless subscriber unit that is served by a neighboring cell but could be served by the first cell. The method includes another step of allocating (340 of Fig. 3 and page 19 lines 24-32) an outage alarm priority for said first cell based on the calculated degree of coverage overlap.

Claim 12 includes all the recitations of claim 1 the apparatus form of a communication unit (146 of Fig. 1). Specifically, claim 12 provides a communication unit for use to determining per-cell traffic overlap coverage in a cellular communication system (100 of Fig. 1) that comprises multiple cells (210-270 of Fig. 2). The communication unit includes a receiver for receiving measurements (page 11 lines 12-19) of parameters relating to one or more operations of a first cell in said cellular communication system. The communication unit also includes a processor (155 of Fig. 1), operably coupled to said receiver, to process said received data, wherein said processor calculates a degree of coverage overlap based on a number of said measurements by partitioning said received measurements (page 11 lines 22-33) into at least one of three categories with respect to the first cell, selected from the group of: (i) A first category indicating a wireless subscriber unit that is uniquely served by the first cell, (ii) A second category where the measurement indicates a wireless subscriber unit that can be served by a number of cells, and (iii) A third category where the measurement indicates a wireless subscriber unit that is served by a neighboring cell but is located such that it could be served by the first cell. The processor (155) allocates an outage alarm priority for said first cell based on the calculated degree of coverage overlap (page 18 line 1).

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 2, 4, 6, 9, 12, 14, 16, 18, 19 and 21 have been rejected under 35 U.S.C. §103(a) as being anticipated by Shafran et al. (US 2003/0186693), in view of Dillinger et al. (US 2004/0058679) and further in view of Croslin (US 6295275).

Claims 3 and 13 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of US Prov. 60/369,368.

Claims 7 and 20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of Andersson (US 6,173,168).

The appellant disputes these rejections.

7. ARGUMENT

(i) Rejection under 35 U.S.C. §112, first paragraph:

None

(ii) Rejection under 35 U.S.C. §112, second paragraph:

None

(iii) Rejection under 35 U.S.C. §102:

None

(iv) Rejection under 35 U.S.C. §103:

A. Rejection under 35 U.S.C. 103(a) – Shafran in view of Dillinger and Croslin

The Examiner rejected claims 1, 2, 4, 6, 9, 12, 14, 16, 18, 19 and 21 under 35 U.S.C. §103(a) as being anticipated by Shafran et al. (US 2003/0186693, hereinafter "Shafran"), in view of Dillinger et al. (US 2004/0058679, hereinafter "Dillinger") and further in view of Croslin (US 6295275).

Preamble of claim 1

In the Final Office Action and Advisory Action the Examiner states that Shafran and Shapira teach a method of determining per-cell traffic overlap coverage in a cellular communication system that comprises multiple cells (Shafran: Title Abstract; pars. 0036, 0037; Fig. 2, Shapira par. 0038). (It should be noted that Shapira was not previously cited by the Examiner against claim 1.) Even so, Shafran is concerned with traffic density of each cell and is not concerned with overlapping coverage between cells. As far as Shapira, appellant is unable to discern anywhere where Shapira discusses a unique coverage function (UCF). Even if a unique coverage function were disclosed, Shapira is again concerned with traffic density, which considers traffic in an entire cell. In contrast, appellants' invention instead concerns overlapping areas of cells. Shapira is concerned about a coverage area of entire cells without consideration of the difference between overlapping or non-overlapping conditions between cells. Even if one to consider a unique coverage factor per cell, it is not a simple matter to then define overlapping coverage areas between cells as appellants' invention has done. Considering only overlapping areas of coverage is different than considering traffic density per entire cells as in the cited art. Therefore, appellant submits that the solution provided by claim 1 is different than the cited art.

First element of claim 1

With respect to the first element of claim 1, the Examiner stated that Shafran discloses receiving measurements of parameters relating to one or more operations of a first cell (Shafran par. 0037).

Appellant is willing to submit that it is known to receiving measurements of parameters relating to operations of a cell.

Second element of claim 1

With respect to the second element of claim 1, the Examiner stated that Shafran discloses where the parameters include information relating to how many and which cells serve a wireless subscriber unit by collecting handoff and traffic statistics (Shafran par. 0014, 0021). Appellant respectfully disagrees and submits that handoff and traffic statistics could only be used to indirectly imply an overlap condition, and does not provide a definitive solution to identify an overlap condition, as in claim 1.

In particular, Shafran describes the monitoring of statistical traffic distribution among the cells of a network. As such, Shafran is attempting solving a similar problem as appellants' invention, but in a completely different way (i.e. from the network side instead of from the mobile side) using completely different means (i.e. a statistical approach that does not involve specific cells or mobiles instead of appellants' approach of using a specific mobile and its cell registration), as thus must arrive at a different result. Shafran's statistical distribution does not identify overlapping conditions, as in appellants' solution, but only deals with traffic density, and therefore does not fulfill this element. Therefore, Shafran can not solve the problem in the same way of appellants' solution in using overlap conditions, as defined in claim 1.

Third element of claim 1

With respect to the third element of claim 1, the Examiner stated that Shafran discloses calculating a degree of coverage overlap for a cell based on the measurements and partitioning the measurements into three categories with respect to the cell, selected from the group of: (i) A first category where the measurement indicates a wireless

subscriber unit that is uniquely served by the first cell, (ii) A second category where the measurement indicates a wireless subscriber unit that can be served by cells other than the first cell, and (iii) A third category where the measurement indicates a wireless subscriber unit that is served by a neighboring cell but could be served by the first cell (Shafran pars. 0033-36). Appellant respectfully disagrees and submits that Shafran discloses a completely different calculating and categorizing steps and partitions the information in a completely different way, and therefore does not provide the definitive solution of claim 1.

In particular, Shafran identifies dividing a cell into sub-areas such as a highway [par. 0034]. In this case, the highway sub-area may be identified as an area of high traffic density, but there is nothing to indicate that this sub-area of a cell exhibits a high overlap with another cell. Traffic density does not correlate with traffic overlap. Indeed cells can be configured to provide no overlap (e.g. see page 7 lines 15-16). Therefore, if such a cell drops from the network, there is no overlapping cell to replace it, and Shafran does not provide a solution therefor. Appellants' solution is different, in that, once an accurate knowledge of coverage overlap has been determined the relative importance of keeping various cells on air can be identified (see page 7 line 26 to page 8 line 1). In other words, completely overlapping cells need not have high priority, even if the density is high. In contrast, Shafran ranks priority based solely on density, and does not consider overlap. Appellants' solution provides that cells without overlap (unique coverage) are assigned high priority first, over that of traffic density issues.

Fourth element of claim 1

With respect to the fourth element of claim 1, the Examiner has admitted that Shafran does not particularly teach allocating an alarm priority based upon degree of overlap coverage, but that Dillinger does so teach (par. 0038). Appellant respectfully disagrees. Although Dillinger [para. 0038] does disclose assigning a priority, the priority is based upon reception field strength for cells having different network access technologies, which is completely different from appellants' allocating an outage alarm priority, and a priority based on coverage overlap of the same network access technology, which is neither disclosed in Shafran nor Dillinger.

As a result, the cited art, either in combination or alone, is missing at least the many elements of; a) measuring coverage overlap, b) partitioning overlap measurements, c) partitioning a first category of no overlap, d) partitioning a second category of partial overlap, e) partitioning a third category of full overlap, f) an outage alarm priority, and g) basing the priority on coverage overlap.

Therefore, appellants respectfully submit that claim 1 is patentably distinct and non-obvious from the cited art, and is therefore deemed allowable.

Claim 12

Independent claim 12 includes the same recitations as detailed with respect to claim 1 above, in apparatus form. The appellant therefore respectfully submits that all of the points raised above with respect to the claim 1 are relevant for claim 12 as well. Those points will not be repeated here, however, for the sake of brevity, but to say that claim 12 is deemed allowable as well for the same reasons.

Dependent Claims

Appellant respectfully submits that claims 2, 4, 6, 9, 14, 16, 18, 19 and 21 are dependent on their respective base claims 1 and 12, hereby incorporated by reference, and are therefore deemed allowable as well in view of this dependency.

As a result, the appellant respectfully submits that claims 1, 2, 4, 6, 9, 12, 14, 16, 18, 19 and 21 are allowable over the references of record and respectfully requests a corresponding ruling.

B. Rejection under 35 U.S.C. 103(a) – Shafran in view of Dillinger, Croslin & Shapira

The Examiner rejected 3 and 13 under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of US Prov. 60/369,368, hereinafter "Shapira".

Shafran, Dillinger and Croslin have been distinguished over previously. Appellants' distinguishing remarks providing the benefits of the invention and disadvantages of this art, to the extent applicable, are hereby incorporated by reference.

The Examiner readily admits that Shafran, as modified by Dillinger and Croslin, does not show the formula of claims 3 and 13, but argues that Shapira does so show.

Shapira discloses the determination of traffic distribution data in a network. Using the Section 2, formula 4, reference cited by the Examiner, Shapira formulates an interference probability between cells using; a) traffic density in a bin, b) the probability of a neighboring cell serving that bin, and c) a percentage of damaged traffic due to neighboring cell reusing a frequency. Of these three elements only the second element (b) could even possible relate to appellants' claims 3 and 13, and even so, element (b) relates to the probability of serving, whereas appellants' formula relates to the number of cells that are not serving. Therefore, Shapira actually teaches away from appellants' invention. Further, Shapira is calculating an interference probability, whereas appellants are calculating a coverage factor, which is completely different. The formula of Shapira only provides a superficial resemblance to appellants' formula, has different variables, and provides a completely different result than appellants' formula. Therefore, the formula of Shapiro could not possibly be used to provide the solution provided by appellants' invention.

Moreover, claims 3 and 13 are dependent on amended claims 1 and 12, respectively, hereby incorporated by reference, and are therefore deemed patentable and non-obvious as well for the same reasons.

C. Rejection under 35 U.S.C. 103(a) – Shafran in view of Dillinger, Croslin & Andersson

The Examiner has rejected claims 7 and 20 under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of Andersson (US 6173168).

Claims 7 and 20 are dependent on amended claims 1 and 12, respectively, previously distinguished and hereby incorporated by reference, and are therefore deemed allowable as well for the same reasons.

(v) Other rejections

None.

In conclusion, and for the above reasons, the appellants respectfully submit that rejected Claims 1, 2, 4, 6, 9, 12, 14, 16, 18, 19 and 21 under 35 U.S.C. §103(a) as being anticipated by Shafran et al. (US 2003/0186693), in view of Dillinger et al. (US 2004/0058679) and further in view of Croslin (US 6295275), rejected Claims 3 and 13 under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of US Prov. 60/369,368, and rejected Claims 7 and 20 under 35 U.S.C. §103(a) as being unpatentable over Shafran, in view of Dillinger, further in view of Croslin, as applied to claims 1 and 12, and further in view of Andersson (US 6,173,168), are in error and should be reversed and the claims allowed.

8. CLAIMS APPENDIX

1. (previously presented) A method of determining per-cell traffic overlap coverage in a cellular communication system that comprises multiple cells, the method comprising the steps of:

receiving measurements of parameters relating to one or more operations of a first cell in a cellular communication system, wherein said parameters include information relating to how many and which cells serve a wireless subscriber communication unit;

calculating a degree of coverage overlap for said first cell based on a number of said measurements by partitioning said measurements into at least one of three categories with respect to the first cell, selected from the group of:

(i) A first category where the measurement indicates a wireless subscriber unit that is uniquely served by the first cell,

(ii) A second category where the measurement indicates a wireless subscriber unit that can be served by cells other than the first cell, and

(iii) A third category where the measurement indicates a wireless subscriber unit that is served by a neighboring cell but could be served by the first cell; and

allocating an outage alarm priority for said first cell based on the calculated degree of coverage overlap.

2. (previously presented) The method of determining per-cell traffic overlap coverage in a cellular communication system according to Claim 1, wherein the step of calculating a degree of coverage overlap based on a number of said measurements employs a statistically valid sample of said measurements.

3. (previously presented) The method of determining per-cell traffic overlap coverage in a cellular communication system according to Claim 1, wherein the step of calculating comprises determining a unique coverage factor (UCF) for that cell using Measurement Reports (MR), where:

$$\text{UCF} = \frac{\text{Sum of MRs with no and/or weak neighbors}}{\text{Total Sum of MRs}}$$

4. (previously presented) The method of determining per-cell traffic overlap coverage in a cellular communication system according to Claim 1, the method further comprising the step of:

converting a number of measurements to Erlangs to determine a coverage overlap based on subscriber traffic within said cell.

5. (canceled).

6. (previously presented) The method of determining per-cell traffic overlap coverage in a cellular communication system according to Claim 1, the method further comprising the step of:

in response to said calculation, re-configuring at least one operational parameter of said cell selected from the group of; a transmit power, a beam-forming antenna changes, and turning off a cell.

7. (previously presented) The method of determining per-cell traffic overlap coverage in a cellular communication system according to Claim 1, the method further comprising the steps of:

storing said calculations; and

using said stored calculation subsequently to determine a cell outage strategy.

8. (previously presented) The method of determining per-cell traffic overlap coverage in a cellular communication system according to Claim 1, wherein the steps of measuring and calculating are used in an automatic frequency planning operation of said cellular communication system.

9. (previously presented) The method of determining per-cell traffic overlap coverage in a cellular communication system according to Claim 1, wherein the wireless communication unit receives measurement reports from a wireless serving communication unit selected from the group of; a base transceiver station and a wireless subscriber communication unit.

10-11. (canceled).

12. (previously presented) A communication unit to determining per-cell traffic overlap coverage in a cellular communication system that comprises multiple cells, the communication unit comprising:

a receiver for receiving measurements of parameters relating to one or more operations of a first cell in said cellular communication system; and

a processor, operably coupled to said receiver, to process said received data, wherein said processor calculates a degree of coverage overlap based on a number of said measurements by partitioning said received measurements into at least one of three categories with respect to the first cell, selected from the group of:

(i) A first category indicating a wireless subscriber unit that is uniquely served by the first cell,

(ii) A second category where the measurement indicates a wireless subscriber unit that can be served by a number of cells, and

(iii) A third category where the measurement indicates a wireless subscriber unit that is served by a neighboring cell but is located such that it could be served by the first cell, wherein

the processor allocates an outage alarm priority for said first cell based on the calculated degree of coverage overlap.

13. (previously presented) The communication unit according to Claim 12, wherein said processor determines a unique coverage factor (UCF) for a cell using Measurement Reports (MR), where:

$$UCF = \frac{\text{Sum of MRs with no and/or weak neighbors}}{\text{Total Sum of MRs}}$$

14. (previously presented) The communication unit according to Claim 12, wherein said processor converts a number of measurements to Erlangs to determine a coverage overlap based on subscriber traffic within said cell.

15. (canceled).

16. (previously presented) The communication unit according to Claim 12, wherein, in response to said calculation, said communication unit is operable to re-configure at least one operational parameter of said cell.

17. (previously presented) The communication unit according to Claim 16, wherein said communication unit configures said cell for at least one of the group of; transmit power changes, beam-forming antenna changes, and switching off said cell site.

18. (previously presented) The communication unit according to Claim 12, wherein said communication unit is an operations and management centre configured to receive measurement report data relating to cells in said cellular communication system.

19. (previously presented) The communication unit according to Claim 12, wherein said measured data includes at least one of the following:

(i) Cell statistical information including at least one of Congestion, Blocking, Mean-Hold Time (MHT), and Handover (HO) Cause distribution information;

(ii) One or more Measurement Reports; and

(iii) Control Signalling behavior.

20. (previously presented) The communication unit according to Claim 12, wherein said processor is operably coupled to a memory device for storing said calculations for subsequent use in determining a cell outage strategy.

21. (previously presented) The communication unit according to Claim 12, wherein said communication unit is able to communicate on at least on of a GSM, GPRS, UMTS, iDEN, and CDMA cellular communication system.

9. EVIDENCE APPENDIX

Not applicable

10. RELATED PROCEEDINGS APPENDIX

Not applicable

Respectfully submitted,

Stephens et al.

By: /Brian Mancini/

Brian M. Mancini
Attorney for Appellants
Registration No. 39,288
Tel. No.: 847/576-3992
Fax No.: 847/576-3750

Motorola, Inc.
Law Dept. - 3rd floor
1303 E. Algonquin Rd.
Schaumburg, IL 60196